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THE REPUBLIC OF PANAMA*

BY COL. G. E. CHURCH

ANOTHER turn of the historic kaleidoscope, and this time the *trait d'union* between North and South America is an independent State. What are the physical characteristics, the geographical advantages, the prospective means for existence possessed by this newly fledged commonwealth?

Its southeastern boundary, if the old departmental limits be maintained, will follow the Serrania del Darien, which is the *divortium aquarum* between the basin of the river Atrato and its estuary and the valley of the Tuira, which drains into the Gulf of Panama. The line commences in the little bay of Aguacate or Octavia, in front of point Mazo or Morroquemado, and thence runs north-northeast, then north along the summits which separate the rivers that flow to the Pacific from those which run to the Atlantic. Reaching the headquarters of the Jurado, it turns west towards the heights of Aspave. It then follows, generally in a northeast direction, the divide between the Gulf of San Miguel and the river Atrato, until it reaches the ocean entrance to the Gulf of Uraba, where it diverges northwest to the headquarters of the river Tarena, the course of which, until it empties into the Gulf of Uraba, serves as the most northern section of the boundary in question.†

The frontier with Costa Rica will, according to the award of President Loubet in 1900, start from Cape Mona, on the Caribbean Sea, and enclose, on the north, the basin of the river Tarire (the lower course of which is sometimes called the Sixola), and then, by the watershed between the Atlantic and the Pacific (which is the narrow-crested

* Reprinted from the *Geographical Journal*, December, 1903.

†See Perze, *Geografia Fisica de los Estados Unidos de Colombia.*

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Cordillera of Talamanca), southeasterly to 9 degrees N. lat.; thence, it will take a southerly direction and follow the divide between Chiriqui Viejo and the tributaries of the Gulf of Dulce, and terminate at Point Burica, on the Pacific Ocean.

A great river, the Atrato, flows in a deep gorge northward into the Gulf of Uraba or Darien, and separates the "Occidental Cordillera" of Colombia from the outlying parallel coast range, washed by the waves of the Pacific Ocean, and known as the Sierra de Baudo. This is generally low, its highest peak being only 6,000 feet above the sea. Its average elevation is from 2,600 to 3,300 feet, and its lowest depressions from 1,000 to 1,600. It is a wild chaos of ridges, highlands, and spurs, terribly ravined by torrential rains, thickly forested, and rendered almost impassable by an infinite number of rivers, brooks, and tropical swamps and jungles—a pestiferous region uninviting as a home for man.

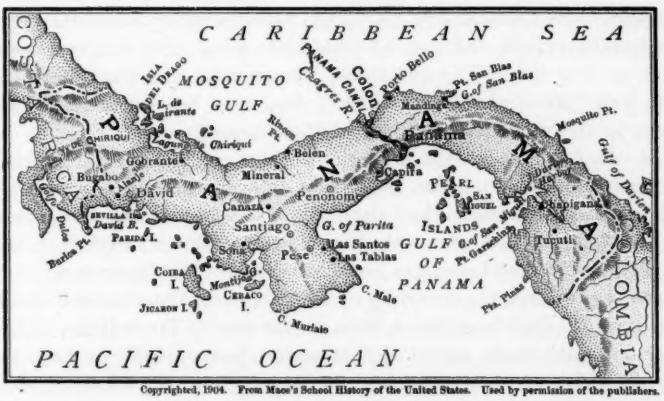
In the latitude of the Gulf of Uraba, the extension of the Sierra de Baudo pushes into the Isthmus of Panama, on the Pacific side, as far as the mouth of the river Bayamo or Chepo, where it completely disappears. *En route* it breaks down to give place to the Bay of San Miguel and its tributary river system of the Tuira. Southeast of this bay is a low *massif* called the Altos de Aspave, and northwest of it another culminating height, broadly spurred and counterforted, connected by a transverse ridge with the low range which overlooks the Gulf of Darien.

The Altos de Aspave throws off, to the northeast, the Serrania del Darien, which crosses from the Pacific Coast to the mouth of the Gulf of Uraba. Thence it skirts the Caribbean coast as far as Porto Bello, occasionally, for long distances, rising from the seashore in bold escarpments. Its principal summits are from 500 to 2,700 feet above the sea.

At the Chagres River, that *bête noire* of the Canal Company, the Serrania del Darien completely breaks down, and the summit height between the two oceans is but 300 feet above sea level. With the exception of the interoceanic water-divide in Nicaragua, which is 153 feet, it is the lowest break in the Andean and Rocky Mountain chain between the Straits of Magellan and Northern Alaska.

The orographic system of the western half of the Isthmus of Panama is bolder and better defined than that of the eastern portion. The region has a broad backbone ribbed by numerous counterforts, but occasionally broadening into complex belts of highlands and isolated *cerros*. From the Costa Rica frontier, the range takes the name of

Sierra de Chiriqui, then Veragua, and afterwards is known as the Sierra de Panama. In the first is the extinct volcano of Chiriqui, 11,000 feet* elevation above the sea, but the entire sierra has an average altitude of 6,500 feet. The Sierra de Veragua presents us with the dome of Santiago, which rises to 9,275 feet, while the Tuta reaches 5,000 and the Santa Maria 4,600. The Sierra de Panama seems to be thrown broadcast into disorderly fragments without law or regularity, and its summits nowhere exceed an elevation of 1,600 feet.



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MAP I. THE REPUBLIC OF PANAMA.

Showing the new boundary lines, the route of the Panama railroad, and the proposed route of the Panama canal.

West of Montijo Bay, on the Pacific side, a broad and massive mountain outwork forms the peninsula of Las Palmas, and between that and the Bay of Panama lies the great peninsula of Azuero, which shows a capricious, distinctive orographic system of highlands and sierras. Its bold headlands, which overlook the ocean, rise to an altitude of 3,000 feet.

About 150 short rivers flow to the sea from the northern side of the isthmus, and over double that number drain its Pacific slope. The largest and most important is the Tuira, which rises in the Pirri Mountains just north of the Bay of San Miguel, and empties into this. The Tuira is navigable for river schooners as far up as the first Spanish settlement, Santa Maria del Real; but, owing to the bars, they can not ascend to Pinogava, which is the highest point reached by the tides.

*F. J. Vergara y Velasca, *Nueva Geografia de Colombia.*

During the dry season, the river-bed above tidewater is a succession of rapids, beyond which the river dwindles into a small stream. The marks on the trees indicate a rise of sixteen feet during the wet season, when the volume of water carried by the Tuira and its eleven main tributaries is immense. Its principal affluent is the Chucunaque from the north. It is nearly as large as the Tuira itself.

The Bayamo, or Chepo, rises in the same knot as the Chucunaque, but flows northwest and then west and south until it discharges into the Gulf of Panama. It is about 150 miles long, and it is claimed that 130 miles of its course can be navigated by rafts and small craft. It has a wide estuary, the entrance to which has a bar with but two feet of water at low tide. The remaining streams on the Pacific side are short and torrential, and of little value, even for canoe navigation, except in the immediate vicinity of their mouths.

On the Caribbean slope of Panama there are but two of its many rivers which merit attention, as offering some advantages as commercial outlets for the districts they drain. These streams are the Chagres and the Teliri, known now as the Tarire in the decision of the boundary-line dispute between Colombia and Costa Rica. The Chagres, a historic waterway ever since the discovery of the Isthmus of Panama by Colombo, flows into the Caribbean Sea a little to the west of Porto Bello. It has a bar on which there are 11 feet of water, just outside the Laja reef, through which there is a passage 70 feet wide with 14 feet of water. The Chagres is navigable for boats to within fourteen miles of the Pacific, and is tame or fierce according to the season. In the dry season it is a deep ditch with a few feet of muddy water at the bottom, but when the saturated clouds burst over its drainage area of 1,000 square miles, and pour into it, at times, a uniform depth of seven inches of water in a day, the river rises over forty feet in twelve hours, and carries with it, in its torrential race to the sea, a vast mass of tropical, arboreal rubbish, clay, mud, and detritus which it receives from its swollen tributaries. It will be extremely interesting for the engineering and financial world to watch the coming contest between the Chagres River and the United States Treasury. In comparison to the Chagres, the San Juan River of Nicaragua is a plaything.

The Tarire, the mouth of which is in lat. 9° 34′ 14″ N., runs along the southern base of the great eastern counterfort of the Talamanca-Chiriqui range, through a spacious, undulating wooded valley of 100 to 150 square miles area, having low grounds which are sometimes dry and at others swampy. Its Urén branch rises on the northeast slope

of the Pico Blanco, the view from the summit of which is said to be "incomparably more extensive" than that from the crest of the Costa Rica volcano of Irazu. The Tarire is navigable for light-draft steamers for fifteen miles up, but, from the Urén to Gule, there are twenty-six rapids and numerous snags. Boats carrying half a ton of goods ascend to Sapurio, one and one-half miles up the Urén. Between the Tarire and the small river Tilorio farther south is the crooked, narrow, and deep estuary called the Laguna de Sansán, an ancient affluent of the Tilorio, full of sharks, alligators, and fish. It receives a little stream called the Dalni, which drains an impassable swamp. Southeast of and near the Tilorio is the Boca del Drago, one of the entrances to Almirante Bay.*

Panama has many bays and ports on both oceans, but the greater part of them seem to be the undisturbed home of silence and primeval solitude. There is no accessible country behind them which offers an easy field for development. He is a bold pioneer who dares to throw down the gauntlet to nature in Panama. There she displays her forces with magnificent abandon; the very ocean-margin is a wall of vegetation; nearly every swamp, hill, slope, mountain-side, and gorge is densely packed with growth of trees, shrub, vine, parasite, and grasses, forming a tangled jungle, sweating with the effort to maintain existence under the vertical rays of a tropical sun. The view is beautiful from the deck of a vessel, and no wonder that Luiz Colombo selected a part of "Castilla del Oro" as his fairyland, where his imagination might revel to the full, but which, unhappily, could yield him no other satisfaction. Four centuries have passed since he received his grant of ducal Veragua, and although it is within easy touch by sea with North America, it remains as the great Colombo discovered it, and as it was when for centuries it was the buffer region between Aztec and Ingarial civilization, so called. With the exception of bananas, no crop could be planted which would pay for clearing the lands of such a region, and keeping them cleared; and even bananas would not flourish sufficiently well if cultivated at an altitude exceeding 1,500 feet above the sea. However numerous the ports and bays of Panama on the Atlantic side, it is probable that many more centuries must pass before they become of any marked importance as commercial centers.

Starting from the Costa Rica boundary, the first great well-protected sheet of water is Almirante Bay, which in reality is the northwestern prolongation of the Laguna of Chiriqui. Together they form a vast

*See G. E. Church, *Costa Rica Geographical Journal*, 1897.

sheet of water. The former is thirteen miles long from east to west, and varies in breadth from two to thirteen miles. Its many harbors offer secure anchorage to ocean-going ships of the largest class, which may often moor alongside the shore. A low ridge of hills borders its southern side, in some places rising boldly to several hundred feet elevation, and two miles inland, reaching an altitude of 1,700 to 2,000 feet. The bay contains many large and small islands. Its main entrances from the sea are the Boca del Drago and the Boca del Toro, the former very tortuous, but having a depth of nine fathoms of water; the latter offers five fathoms, but the channel is only a quarter of a mile wide, and bordered by coral reefs. The latter entrance gives its name to a small Colombian settlement supported principally by banana cultivation, the product being shipped to the United States.

The Laguna de Chiriqui is thirty-two miles long and twelve wide, narrowing to five miles at its southeastern extremity, and ten at its northwestern. Vessels of any craft may enter it from the ocean by the Boca del Tigre by an 8-fathom channel, and find ample security in fifteen to twenty fathoms of water. The eastern and southern shores are low and swampy for a long distance inland, but at one point a spur of the Veragua range penetrates to within two miles of the southeastern side of the laguna, where it has an elevation of 2,672 feet. The dense forest growth, which occupies the mountain-and-hill slope which surrounds nearly the whole of the Chiriqui laguna, extends upwards nearly to the water-divide between the northern and southern oceans, and, secure in its solitude, nature revels there in all the fantastic display of an exuberant vegetation. But, crossing the *serrania*, there is a marked change; the forests give way to grass lands along the mountain flanks towards the Pacific Coast, and cultivated fields, pastures, and habitations of man indicate that here nature is in a less riotous mood. The distance from the Atlantic to the Pacific, across the district described, is fifty miles. The mountain slopes, owing to the ceaseless erosion of the rain-laden trade winds, are sharper on the Caribbean side than on the Pacific incline, which is also much drier than the former. This is true of the whole isthmus—at least, that part west of the Gulf of San Miguel.

From the Laguna de Chiriqui eastward to the river Chagres, the forbidding coast-line (of coral reef, sandy beach, mangrove swamp, and a few precipitous bluffs) has no sheltered anchorage. A heavy surf breaks continually along nearly the entire shore. To the westward of the Chagres River twenty-five miles, and to the eastward of

it as far as Porto Bello, the shore is low and flat, and deadly exhalations from the swamps veil the interior of the country from view.

The so-called Bay of Colon, named in honor of Colombo, who discovered it in 1502, lies just to the east of the mouth of the Chagres River. It is poorly sheltered, and, being open to the north, is exposed to "northers," which frequently blow with such violence that the shipping is forced to run out to sea or seek shelter at Porto Bello. This place, historic in the colonial period of South America, and then the seat of the galeon trade between Spain and the West Coast, is a pestilential port without ventilation, owing to the high hills which enclose it on the north and south and prevent the winds from sweeping away the malignant miasma which continually arises from the swamps on the east. A coral reef skirts the southern shore, and the city and the ruins of the castle of San Jerónimo are situated on the beach in the southeast corner. The width of the entrance to the port is one and one-fourth miles, but it soon narrows to half a mile. The depth of the water gradually increases to seven fathoms. Porto Bello, as a harbor, is the best between Almirante Bay and that of San Blas. In fact, there is no other worth mentioning.

Of San Blas, Commander Selfridge, who surveyed it, says: "It extends in a northeast and southwest direction some twenty miles, and is about ten miles in extreme breadth. It is formed by the cape of San Blas and the outlying islands of the Mulatas archipelago, and is a most magnificent bay, with deep passages, and perfectly protected from the north winds in the dry season. In the northwest corner is an inner harbor formed by a circle of islands, with a passage leading into it. This harbor is magnificent for all purposes required as the great terminus of an interoceanic canal." Gen. E. W. Serrell says of the Bay of Mandinga, which is at the southwest side of the Gulf of San Blas: "The water is eighty feet deep within 100 feet of the shore, and nowhere less than sixty feet deep all the way into the Atlantic Ocean." The width of the isthmus at San Blas, from ocean to ocean, is thirty-seven miles. This is the shortest interoceanic distance on the Western Continent.

From San Blas Bay, for a distance of about eighty miles, is the remarkable belt of cays, islands, and reefs known as the Mulatas archipelago. The cays are sandy and mostly in clusters, but little out of water, and thickly wooded. Between them are found many navigable channels. East of the Mulatas, and as far as Port Escocés, many cays also make the coast navigation dangerous and extremely

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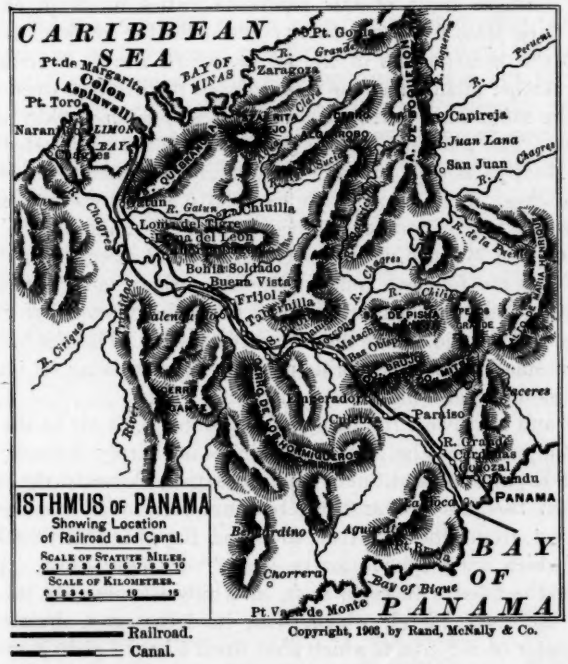
difficult; but farther towards the Gulf of Uraba, these obstructions cease to exist.

Between Point Sasardi and Point Escocés is a broad line of cays, sheltering what is known as Caledonia Bay, in which are two harbors, the western called Sasardi, and the eastern one known as Caledonia. The former is about three-quarters of a mile in extent, with four to six fathoms of water; and the latter, the entrance to which is obstructed by dangerous shoals, has from eight to nine fathoms at the anchorage. The bold Atlantic frontage of the Serrania del Darien, from the Gulf of Uraba to Porto Bello, is thickly forested, and receives the full force of the northeast trade winds, with a resultant heavy rainfall.

Turning to the Pacific Coast, we find the Gulf of San Miguel, or "Darien of the south," on the eastern side of the great shallow Bay of Panama. At its head is the Bay of San Miguel, which was a great resort for the buccaneers, who reached it from Caledonia Bay in ten days by one of the routes which served for communication between the oceans by the Indian tribes before the discovery of America. The bay is over six miles wide at its mouth. It has plenty of water on its eastern side, but is shallow on its western one. As at Panama, it has a tidal range of twenty feet or more, while Caledonia Bay, on the Caribbean side, like Colon, is almost tideless. Darien harbor, at the head of the gulf or estuary of San Miguel, extends in a southeast direction up to the village of Chupigana, where it receives the Tuira and Savana rivers. Its deep water affords anchorage to the largest ships. Mangrove swamps, backed by thickly wooded hills, are almost continuous along its shores.

The island-filled Bay of Panama, at the head of which is the famous city of the same name, is well known. It commences at Cape Garachina, at the southern entrance of San Miguel, makes a majestic sweep concave to the south, and terminates at Cape Malo, which is the southeast cape of the great peninsula of Azuero. The great distance between the two capes is about 100 miles. The northern part of the bay is shallow, and large ships have their anchorage near the famous island of Taboga, nine miles south of the city of Panama. On this island Pizarro, Almagro, and Luque made their famous contract to discover and conquer the empire of the Incas. The latter was cheated out of his share of the plunder, and Almagro was garroted in prison at Cuzco by the brother of Pizarro. Sailing craft find it extremely difficult to get in or out of the Bay of Panama, but especially out. It is one of the most tedious and difficult bits of navigation in the world. Pizarro

was the first to try it, in November, 1525, but, after seventy days, was forced to abandon the effort to leave the bay; and it is still the similar experience of nearly every craft unaided by steam. It is a region of calms, doldrums, vexatious currents, squalls, rains, and tormenting heat.



MAP II. THE PANAMA CANAL STRIP.

The city of Panama is situated on high ground at the foot of Ancon hill, but west of old Pánama, which was destroyed by the buccaneers under Morgan in 1673. To the mouth of the river Bayamo, about twenty-five miles, and for another equal distance to the southeast, the coast is flooded, and at low water mud flats are exposed for a distance of three miles from the shore; but farther on, as far as the Gulf of San Miguel, the margin is higher, with occasional small hills. From Panama southwest to the Bay of Parita, on the western side of the Bay of Panama, the coast-line is considerably broken, and alternates

between high and hilly ground and low flooded areas, the whole shoreline being generally of mud. The entire shore of the Bay of Parita is flooded land, and has a forbidding mud flat extending from two to three miles out. From this bay to Cape Malo, about forty miles, the coast is well out of water and backed by the highlands of the peninsula of Azuero.

The southern front of this peninsula varies much in character; west of Cape Malo for about twenty-five miles the lowlands soon give place to the escarpments of the *cerros*, which rise to a considerable altitude farther inland, and the remainder of the frontage overlooks the ocean, the mountains, furrowed with gorges, pushing boldly down to the coast. The west side of the peninsula, which partly shelters the Gulf of Montijo, is high ground at times, and at others low with occasional beaches. It has many little bays, with a southwestern exposure, which receive the torrents that descend from the mountains.

The Gulf of Montijo, penetrating north about twenty miles, has an opening of some fourteen miles. The short river San Pedro flows in at its head, and is navigable for small craft about seventeen miles up to the port of Montijo, where there is a little traffic. The gulf has several large and small islands, the principal one, Sabaco, lying off its mouth and completely sheltering it from the south winds.

West and northwest from the Gulf of Montijo, as far as the Bay of David, the coast for the first twenty miles is sharply defined; thence, as far as Espartal Island, many hill spurs push down to the sea; the shore then becomes low and cut by numerous small streams. The whole coast, from Montijo's Gulf to David Bay, has many little bays, most of which are available for vessels of very light draft. The bay last named is filled with cays, reefs, and hilly islands. At its head it receives the river David, which, with its tributaries, drains a vast amphitheater of mountains which abut upon a broad plain surrounding the little port of David near the river delta. The river has its sources in the *serrania* of Chiriqui, and several of its branches drain the southeastern slopes of the great volcanoes of Chiriqui and Horqueta, the latter 6,600 feet elevation. West of the delta of the David, the coastline bends in a great curve to the south until it reaches Point Burica at the termination of a peninsula formed by a rugged spur of the Chiriqui mountains.

The Pacific coast-line of the Isthmus of Panama is about one-third greater in extent than that of the Caribbean side. There are many islands along both coasts, but those on the Pacific are more numerous and larger than those on the Atlantic.

A thick, dark, primitive forest covers at least three-fourths of the State, and the vegetation in countless forms fights strenuously and ceaselessly with man for possession of the soil. It is nature's favorite tropical hothouse.

The extreme length of Panama, from Colombia to Costa Rica, is about 480 miles, and it varies in width from 37 to 110. Its area is between 33,000 and 34,000 square miles, being more than one-half as large again as its last-named neighbor. About five-eighths of it consists of wild, unoccupied lands, and the remainder is but very rudely utilized by its inhabitants. The population was officially estimated, in 1898, at 340,000, representing such a heterogeneous amalgamation of Spanish, negro, and Indian blood, stirred together by the buccaneers of colonial times, that *white* may, in Panama, be strictly classified as a color. Until I saw a Panama "army" of 150 men at drill, I had no idea that the human form could take such shapes and colors—Proteus would have envied them. And yet these men, like all the Colombians, are first-class fighters, and, well officered, are a foe not to be despised by the best troops ever likely to come into collision with them.

DATA AS TO COST AND ENGINEERING FEATURES OF THE PANAMA CANAL AND COMPARISON WITH THE ESTIMATES FOR THE NICARAGUAN ROUTE

[*Inserted by the Editor.*]

	Panama Route	Nicaragua Route
Cost of Canal as estimated by Isthmian Canal Commission	$144,233,358	$189,864,062
Cost of French Rights	40,000,000	.....
Total estimated cost	$184,233,358	$189,864,062
Annual cost of maintenance, estimated	$1,300,000	less than for Nicaragua.
Length of route	49 miles	186.5 miles
Length of "danger zone" (above tide level)	23.5 miles	176 miles
Time required for passage	11.25 hours	33 hours
Elevation of summit level	90 feet	110 feet
Number of levels to be maintained	2	7
Number of locks required	3	8
Number of dams required	1	1
Terminal harbors	Ready for use	Unbuilt
Construction railway	Ready for use	Unbuilt
Actual work could begin	At once	After 2 years
Rivers to be controlled, as to level	1	2
Lakes to be controlled, as to level	None	1
Flow per second of rivers	75,000 cu. ft.	200,000 cu. ft.
Area of lake		3,000 sq. mi.

TRANSPORTATION

PART I

BY JOHN THOM HOLDSWORTH
Professor of Commercial Geography, Drexel Institute, Philadelphia

NO single part of the whole broad subject of economic geography is more important, more essential to an intelligent understanding of commerce, than transportation; yet strangely enough no part has been so scantily treated by the writers of geography text-books. This series of papers is intended to help in some small way to supply this lack. No attempt will be made to offer an exhaustive study of the theory or philosophy of the science of transportation; the aim will be rather to gather together and make available for teacher and student scattered facts and phenomena directly related to the processes and agencies involved in the movement of the world's great staple products.

After a brief sketch of the historical development of transportation, especial attention will be paid to the problem in our own country, first in its relation to internal or domestic commerce, then in its relation to foreign trade.

The following rough outline will suggest the general plan of treatment:

TRANSPORTATION : AN OUTLINE

Ancient trade routes.
Early canal building in Europe.
Transportation in America:
- The turnpike.
- Canal Era 1825–1837.
  - Contest between canal and railroad.
  - Present status of canals.
  - Commercial canals of United States.
  - Erie Canal.
  - Proposed canals.
  - Canada's waterways.
  - Ship canals of world.
- The Railroad Era.
  - Periods of.

Transportation in America—*Continued*
- Classification.
  - By geographical groups.
  - By financial groups.
- Leading products.
  - The freight service.
- Railway abuses.
- Interstate Commerce Law.
  - The railway problem.
  - Railroad control.
  - Railway clearing-houses.
  - Traffic associations.
- Our Natural Waterways.
- The Great Lakes.
- Isthmian Canal.
- Systems of other countries.

Transportation in America—*Continued*

Merchant Marine.
- History.
- Reasons for decline.
- Remedies.
- Shipping trust.
- Shipping routes.
- Trade of leading ports.
- Comparison with great marine nations.

Great Cable Systems.

Telegraph and Telephone.

Mail service.

Conduits—water, oil, gas.

Transportation is the agency by which the products of one zone or country are brought to another, or by which dissimilar products are exchanged between localities or regions within the same country. It is one of the chief devices by which producer and consumer are brought together. Transportation makes possible (1) the production of articles of necessity, the great staples of trade, where they can be most cheaply produced; (2) the wide distribution of products whose growth is limited by peculiar conditions to certain regions; and (3) the localization of manufactures and other industries where they can be carried on most economically. It is the agency that brings the wheat of Dakota or Hungary to the great flour mills of Minneapolis or Budapest, distributing it in turn to every quarter of the globe as flour. By its aid the giant furnaces of the Pittsburg mills are fed with iron ore from Michigan, Cuba, or Sweden. It makes possible the refining of Luzón sugar in Brooklyn or Philadelphia, and the making of pulp used in our morning paper from timber grown in Northern Ontario. In short, it makes possible that large territorial division of labor which is fundamental to modern industry and trade.

This brief survey from the economist's point of view may serve to suggest how inseparably transportation is linked with the production and distribution of world products. And yet it is quite within the truth to say that transportation is in itself one of the most powerful and complex industries of modern times.

It has been said with truth that a nation's progress, its standard of civilization even, may be judged by its transportation facilities. "Empires and cities have grown or decayed as they were favorably or unfavorably situated along the great highways of commerce." The triteness of this statement is attested on the one hand by the black smoke-banners of a score of American factory towns that have sprung up over night through the projection of a new railroad branch, and on the other hand by the commercial desolation of one-time thriving cities side-tracked through the shifting of the great routes of trade.

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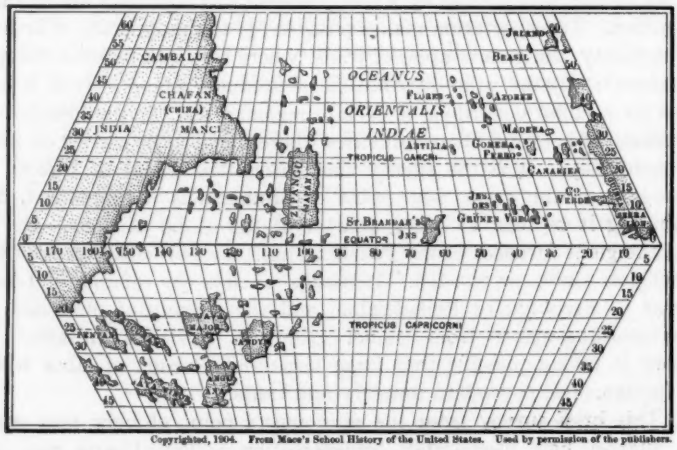
Failure to develop avenues of communication and trade has in all times marked nations and peoples as static or decadent. China, hemmed in largely by nature, secured almost complete isolation for centuries by building the Great Wall and sealing her ports against which the traders of the world thundered vainly for admittance. In the throes of a new birth, the Empire, recognizing the imperative need of better transportation, is granting concession after concession to railway engineers and companies, while a score of open ports invite foreign trade. Whatever Russia's purpose in building the Trans-Siberian Railroad, whether commercial, political, or strategic, this herculean task has focused the gaze of the world upon the Muscovite.



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MAP I. THE TOSCANELLI MAP, 1474

It explains the idea, prevalent at that time, of the size of the world, and how sea merchants sailed, first, east around Africa; and afterwards west, like Columbus in discovering America, in the search for India and the Spice Islands.

The early pages of history reveal that the commerce and civilization of Asia and Europe advanced commensurately with the development of roads and canals. (See Maps I, II, and III.) According to the testimony of the Vedas, the religious books of the ancient Hindus, highways were built by the State connecting the interior with the coast and with adjoining countries. The ancient peoples of Mesopotamia, the first to use domestic animals as beasts of burden, built canals for irrigation purposes and constructed roads leading to their dependencies. The Babylonians not only built highways, canals, and great

Northern Route Controlled by Genoa ---------- Middle Route —·—·—·—
Southern Route Controlled by Venice —·—·—·—

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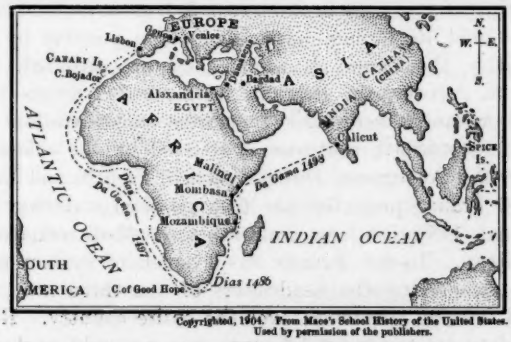
MAP II. OLD TRADE ROUTES TO INDIA.

The ships and caravans traveling over these routes sought the silks and spices from India and beyond, from the Spice Islands.

irrigation works—they even constructed breakwaters and quays along the Persian Gulf for the encouragement of commerce.

The earliest of the great maritime nations of antiquity, Phœnicia, though depending chiefly upon the sea as a highway, built roads connecting its two great cities, Tyre and Sidon, and constructed caravan routes south to Arabia and east to India and China, which countries sent their products to Tyre to be exchanged for the produce brought by



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MAP III. PORTUGUESE VOYAGE TO INDIA.

An all-water route to India was sought by the Portuguese.

Phœnician vessels from the west. So, too, Egypt and Carthage, each of which attained commercial eminence in this early time, maintained highways leading in all directions.

The great Roman Empire, which embraced every civilized nation then known, and which counted some 120,000,000 people, was covered with a network of roads many of which remain to this day the admiration and wonder of the world. It is estimated that 50,000 miles of these highways, built mainly for military purposes, connected the various parts of the Empire. Over many of them the Government maintained an efficient postal service, using fast couriers.

A survey of the history of the great nations that led in trade and civilization after the downfall of the Roman Empire shows a widening use and growth of the improved transportation facilities. Thus, Emperor Maximilian of Germany established a postal route between Brussels and Vienna, in 1516, and at a later date Frederick the Great, recognizing the need of better means of communication, began the construction of turnpikes and canals on a large scale. Since the organization of the various German States into an Empire, Germany has made vast improvements in her internal communications. She has canalized many of her rivers, and has constructed thousands of miles of artificial waterways connecting all the large rivers and affording cheap transport of raw materials to her great industrial centers. The railway system of modern Germany is highly efficient, being controlled for the most part by the State.

As early as the twelfth century, the Dutch began the construction of canals, which, owing to the flatness of The Netherlands, became the common roadways, as they are to-day. The great commercial cities of Amsterdam and Rotterdam have been made possible by deepening and canalizing the rivers on which they are situated. Similarly, Brussels and Antwerp in Belgium have secured access to the sea. That great advances were made in marine transportation in the sixteenth and seventeenth centuries is attested by the colonial empires built up by the Portuguese, Dutch, Spanish, French, and English.

In 1666 France projected her first artificial waterway, the Languedoc Canal, 148 miles long, connecting the Mediterranean with the Bay of Biscay. To-day France has a splendid system of artificial waterways connecting the headwaters of the three most important rivers, and forming a network over the entire country. Russia, that new candidate for commercial honors, has not only pushed to practical completion the great Trans-Siberian Railway, nearly 5,000 miles

in length, linking the Pacific with the Atlantic, but also has under construction one of the greatest of modern canals, connecting the Black Sea with the Baltic. The United Kingdom commenced canal building in 1767, since which time waterways have been dug all over Great Britain to connect the main water courses. Enormous sums have been voted by cities like Manchester and Glasgow to improve their shipping facilities. So, too, on the Continent, Hamburg, Bremen, Rotterdam, Le Havre have made lavish expenditures for dredging, wharfing, and improving their harbors.

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Fig. 1. ANIMALS USED FOR TRANSPORTATION
Long trains or caravans of camels carrying merchandise over a desert region.

On the Western Hemisphere there still remain traces of the wonderful roads built by the Incas of ancient Peru. One of these roads, built of stone, at an elevation of over 12,000 feet, Humboldt estimated to be 2,000 miles long. In its route engineering difficulties that would puzzle the modern engineer were met and successfully overcome. The Spaniards allowed the roads to go to ruin, and they now lie as broken monuments to the skill and enterprise of these wonderful people.

The early settlers of the North American continent depended almost wholly upon the natural water courses for transportation. Heavy forests and the dangers from unfriendly Indians made interior

communication difficult; hence the settlements at first clung close to the river courses or to the seaboard. As settlement gradually spread to the interior, roads of inferior sort were made, but these were for local purposes, and road building was left largely to individual exertion. Thus in colonial days it took a week to go from Boston to New York by stage. Many of the earliest wagon roads followed the trails originally made by deer and buffalo through the forest and over the mountain passes, and naturally the railroads at a later date were projected along the same general routes.

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FIG. 2. A TRADING AND WAR VESSEL USED BY THE NORTHMEN.

The history of internal transportation in this country can be divided roughly into three periods:

1. Turnpikes.*
2. Canals.
3. Railroads.

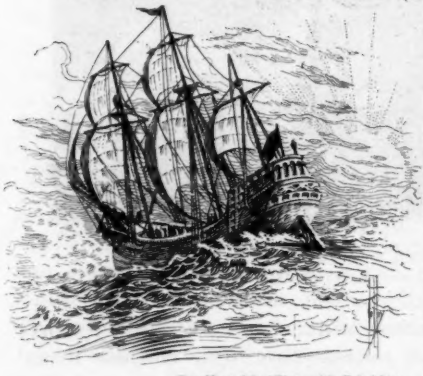

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FIG. 3. A TRADING VESSEL OF THE FIFTEENTH CENTURY.

The first American turnpike was built in Pennsylvania in 1790, and ran from Philadelphia to Lancaster, a distance of sixty-six miles. In the next thirty years that State expended $8,500,000 for such roads. From Pennsylvania the system spread into New York and New England. These roads were constructed and operated by private enterprise and were supported by tolls, which often yielded large profits. They greatly cheapened transportation, and gave reasonable satis-

* "These roads were called turnpikes because at the places where tolls were collected there was placed across the road a gate consisting of a pole armed with pikes, and so hung as to turn upon a post." Johnson, p. 13.

faction. In 1807, Gallatin, Secretary of the Treasury, proposed that the Government should undertake the construction of roads and canals on a large and systematic scale. Local jealousies and the opposition of a powerful faction in Congress who did not believe that the Government should carry on internal improvements delayed for many years the active interest of the Government in road making. Only one important national road was actually constructed — the "Old Cumberland Road." This road was begun in 1811 at Cumberland, Md.,

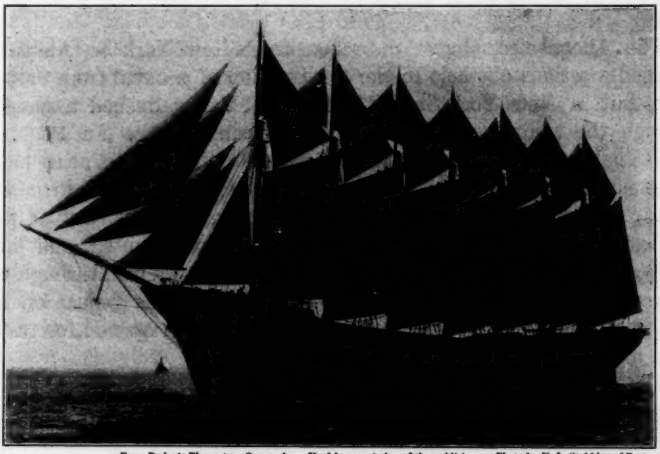

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FIG. 4. THE THOMAS W. LAWSON.

A seven-masted schooner. The largest sailing vessel carrying freight in the world

and continued almost due west in practically a straight line through Maryland, Pennsylvania, Ohio, Indiana, and Illinois to St. Louis. It is said to be the longest straight road ever built by any Government in the world. It was about 700 miles long, and cost nearly $7,000,000.

Along this great "National Pike" a stream of emigration flowed toward the Ohio and Mississippi valleys. Another movement set in farther north toward the prairies of the Great Lakes States. "Pittsburg and Cincinnati, the two main points of transshipment on the southwestern route, had become flourishing business centers, while Buffalo and Cleveland were yet the merest frontier settlements."*

*Hadley, *Railroad Transportation*, p. 29.

THE CANAL ERA, 1825–1837

Toward the close of the eighteenth century, as the people of the new Federal Union became convinced of its permanence, attention was directed to the necessity, in the interests of commerce, of binding together its various scattered parts by a system of canals. General Washington had called attention to the possibilities of a canal westward from the Hudson, and the people of New York had from an early period realized the importance of connecting the Hudson with the Great Lakes.

The Alleghenies, almost unbroken from New York to Alabama, opposed a serious obstacle to the construction of a canal from east to west, but in New York State the Mohawk Valley opened a passage through the chain and suggested a level canal route. In 1810 the Erie Canal Commission was appointed with De Witt Clinton at its head, and a survey was made of the entire route from the Hudson to Lake Erie. Aid was expected from the Federal Government, but at first Madison opposed Federal aid to "internal improvements," and later the War of 1812 stopped all progress. In 1817 New York, through the restless energy of Clinton, decided to go on with the project on her own resources. The whole canal was completed and opened for traffic amid national rejoicing in 1825.

The canal was 378 miles long and 4 feet deep; it had a width of 40 feet at the surface and carried boats of 76 tons burden. The first cost of the canal was $5,700,000, but subsequent enlargements have made the total cost over $50,000,000. The utility of, and the returns from, the canal exceeded the most sanguine expectation. Cities sprang up wherever the canal met a water course, *e. g.*, at Buffalo, Rochester, Syracuse. In 1826, the year after the canal opened, the receipts from tolls were $726,000; in 1833, they had doubled. Tolls were constantly reduced until 1853, when they were only about one-third the original figure, but even then the revenues amounted to over $3,000,000 a year. "The construction of the Erie Canal reduced transportation charges to a little over one-tenth their former figures." *

The opening of the Erie Canal marked the beginning of a mania for canal building.† New York, Pennsylvania, Ohio, Indiana, and Illinois all projected extensive canals, while in many other States private companies commonly aided by the State constructed canals of greater

* Hadley, p. 31.

† Johnston, *Inland Waterways*, p. 31.[1]

or less importance. "In 1834, Pennsylvania had 589 miles of State canals, among them the Central Division Canal 172 miles long, and the Western Division Canal 104 miles long."* In 1832, Ohio opened two important canals, the Ohio Canal from Cleveland to Portsmouth, and the Miami & Erie from Toledo to Cincinnati. The traffic on these canals† reached in 1857 a tonnage of 1,635,774 tons. Indiana completed the Wabash & Erie Canal from the junction of the Miami Canal to Evansville on the Ohio in 1855. The Illinois & Michigan Canal, 102 miles long, from Lake Michigan to LaSalle at the head of navigation on the Illinois, was opened in 1848. It was intended to make this canal deep enough to carry vessels through from the Lakes, a project recently completed by the city of Chicago for sanitary purposes at a cost of $30,000,000.

Besides these great State waterways many canals were constructed and are still operated by private companies. Chief among these were: the Raritan connecting the Delaware River with New York harbor; the Chesapeake & Ohio from Cumberland, Md., to Washington; the Morris Canal across New Jersey; the Delaware & Chesapeake connecting Chesapeake Bay and Delaware Bay; and several canals, mainly in Pennsylvania, for the transportation of coal, *e. g.*, the Delaware & Hudson, Schuylkill, Lehigh, and others.

The panic of 1837 almost completely stopped canal building, and when the country had recovered from that shock, it was felt that the chief means of transportation was to be rail not water. Some local canals, chiefly coal canals, continued a profitable local traffic, but the extension of railroads compelled the steady abandonment of the canals. Only two great systems of water communication — the Great Lakes and the Erie Canal on the north and the Mississippi to the south — have been able to continue in competition with the railroad. It is to be noted, however, that at one time we had 5,000 miles of canal in operation, built at a cost of $150,000,000, and carrying in 1857 traffic amounting to 3,344,000 tons.

* Larrabee, *The Railroad Question*, p. 41.

† Jeans, *Waterways*, p. 195.

(*To be continued in April.*)

THE GEOGRAPHY COURSE IN THE CHICAGO NORMAL SCHOOL*

PART II

BY FRANK W. DARLING AND ELIZABETH SMITH
Of the Chicago Normal School, Chicago, Illinois

SECOND YEAR OF GEOGRAPHY

(Fourteen weeks, five fifty-minute periods, weekly.)

I. THE SUBJECT-MATTER OF GEOGRAPHY

A. Content of Geography: A study of the relations existing between earth and man.

B. Arrangement of the Subject-matter in its Natural Causal Order.

1. Earth.		2. Man.
Topographical conditions.		
Elevation.		
Drainage.		
Soil.	Productive conditions.	Industrial conditions.
Climatic conditions.		Social "
Temperature.	Vegetable.	Commercial "
Winds.	Animal.	Locative "
Rainfall.		Political "

C. Relations of Cause and Effect Existing between these Factors.

1. Tracing the effect of each factor in determining the ultimate conditions of life in typical regions; as, a tropical forest region; a savanna region; a desert region; a tundra region; some temperate regions.

II. THE CHILD'S ATTITUDE OF MIND TOWARD THE SUBJECT-MATTER OF GEOGRAPHY

A. Dependent on Stages of Mental Development.

1. Discussion of child's mental growth from observation and theory.
2. Determination of characteristics of childhood at widely differing ages and then in the different grades.

*Continued from the JOURNAL OF GEOGRAPHY, Vol. III., No. 2, February, 1904, page 64.

3. Naming of stages.
   a. Stage of gathering conceptions. Characterized by sense perception of simple wholes.
   b. Stage of relating conceptions. Characterized by natural tendency to compare and relate the simple conceptions with each other.
   c. Stage of constructing conceptions. Characterized by ability to put together the conceptions gathered through the senses and to construct a new whole distant from sense perception.
4. Discussion to determine relation of stages.
   a. No distinct demarcation, but gradual growth of one into another.
   b. When one stage is attained it continues throughout life of individual.
   c. Determination of the grades in which teacher should count on average child maturing to each stage and formulate work accordingly.
      (1) Gathering conceptions in grades I–II.
      (2) Relating conceptions in grades III–IV.
      (3) Constructing conceptions in grades IV. to the end.

B. Dependent on Child's Environment.

1. City child and his conceptions.
   a. Mainly concerning subject-matter noted under I, *B*, 2. "Man," and end at products of industry.
   b. Necessity of supplementing his knowledge with conceptions of natural phenomena.
2. Country child and his conceptions.
   a. Mainly concerns subject-matter noted under I, *B*, 1; natural phenomena, products, and simple industrial processes.
   b. Necessity of supplementing his knowledge with conceptions of social, commercial, and political conditions.

III. THE ARRANGEMENT OF A PSYCHOLOGICAL COURSE FOR THE GRADES

A. Determining Factors in Arranging Subject-matter for Different Grades.

1. Child's mental ability as indicated in II, *A*.
2. Child's environment as indicated in II, *B*.
3. The causal order of arrangement inherent in the subject-matter as indicated in I, *B*.
4. General aim and motive for teaching geography.
   a. As indicated by the content I, *A*.
   b. Mental discipline of constructive development.

5. Number of years the average child attends school.*

B. Relation One Grade's Work should Bear to Another.

1. Unity of purpose in course as a whole.
   a. Continuity only broken into grades because of arrangement of school year.
2. Necessity for each grade having a special aim and accomplishment, but in harmony with the purpose of the course as a whole.
3. Each grade's work a whole in itself, but also a base for the upper grade's work and growing out of the previous grade's work.

C. Relation of Geography to Other Subjects in the Curriculum.

1. Grouping of subjects.
   a. Language group: Reading; writing; composition; grammar.
   b. Art group: Manual construction; drawing; music; literature.
   c. Number group: Number perception; number relation; algebra, etc.
   d. Science group: Nature study; geography; history.
2. Disciplinary value of each group.
   a. Each contains a part especially adapted to child's ability in each stage.
   b. Some one part of each worthy of special emphasis because of social demand.

D. Analysis of the Science Group to Ascertain the Importance of and the Emphasis on Geography.

1. Nature study or gathering of single conceptions through sense perception especially emphasized in grades I–III.
2. Geography or study of man's earth relation especially emphasized in grades III–VII.
3. History or study of effects of man's relation to earth seen through man's relations to each other especially emphasized in grades VII–VIII.

E. Analysis of Geography Itself to Ascertain Its Importance and Determine the Divisions of Its Subject-matter to Correspond to the Different Stages of Child's Ability.

1. Divisions of subject-matter inherent in subject-matter with order determined by child's ability.
   a. Must have conceptions of objects and conditions in immediate environment in order to

*In Chicago this is an important factor. In the schools of the foreign and overcrowded districts of the city a large per cent of the pupils drop out before the fifth grade and a majority before the sixth grade is finished.

(1) understand relations of objects and conditions in immediate environment. This is essential in order to

(2) comprehend simple and complex conditions and relations in regions distant from immediate environment.

2. Arrangement of these divisions of subject-matter by grades dependent on stages of child's ability in different grades.

a. Conception of immediate environment with simplest relations in grades I and II, as:

(1) Physical and climatic conditions.

(*a*) Directions; time; heat; clouds; rocks; soils, etc.

(2) Products seen in home, market, and field.

(*a*) Harvest crops; domestic animals; wool; fruits; lumber, etc.

b. Interrelation of these immediate conditions as causal to an organized geographical whole, in grade III.

(1) Relations observable between abstract parts of the local center:

(*a*) Parts of the city: Residence portion; productive portion; manufacturing portion; trade portion; shipping portion.

(*b*) Transportation means.

(*c*) Products as relating center to surrounding regions: Shelter; food; clothing.

(*d*) Organization: Commercial; social; political.

c. Simplest conditions and relations in regions distant from immediate environment, in grade IV.

(1) Relations of immediate environment to distant regions leading to a conception of the world as a whole.

(*a*) Northern North America; Mexican Plateau; Amazon Basin; La Plata Basin; Congo Basin; Sahara Desert; Eastern Eurasia, etc.

(*b*) Summary in Earth's physical and climatic relations.

d. More detailed conditions and relations in regions distant from immediate environment, in grades V–VII.

(1) Physical, climatic, productive, industrial, social, locative, and political relations in related regions of continents.

(*a*) North America; South America; Eurasia; Africa; Australia.

e. Relations of great regions to each other, in grade VIII.

(1) Physical relations, climatic relations, productive relations, commercial relations, and political relations of the earth as a whole.

XUM

IV. METHODS OF TEACHING AS APPLIED TO SUBJECT-MATTER DETERMINED FOR EACH GRADE

A. Environment Study. Aim, as determined in III, *E*, to give conceptions of objects and conditions in child's immediate environment, and show the simple relations existing between these and the child.

1. First grade.
   a. Subject-matter: The physical and climatic conditions.
   b. Order and choice of the subject-matter.
      (1) Determined by child's natural contact.
      (2) Determined by season of year for economy of effort.
      (3) Determined by necessity for continuity.
   c. Essentials of presentation:
      (1) Awaken child's interest by showing a motive for knowledge of the topic.
      (2) Observation of the object or condition.
      (3) Bring out relations, of the object or condition, to the child.
      (4) Relations, of the object or condition, to other objects and conditions.
      (5) The next topic for study determined by an intimate relation with the one being studied, and by so doing strengthen:
         (*a*) Sense of relation in child, and
         (*b*) The continuity of the subject-matter.

NOTE:—Together with the discussion of each grade's work the class (1) observes a recitation in each grade, (2) writes a plan for teaching some topic in the grade, (3) collects materials (drawings, pictures, maps, specimens, etc.) for teaching the topic.

2. Second grade.
   a. Subject-matter: The products seen in home, market, and field.
   b. and *c.* Same as in first grade.

B. Geography of the Local Center. Aim, as determined in III, *E*, to bring out the relations of objects and conditions studied in the first and second grades as causal to the organization of a geographical center. Incidental aim: The construction and interpretation of maps.

1. Third grade.
   a. Order and choice of the subject-matter.
      (1) Determined by child's natural contact: Conditions of community in which he lives.

(2) Determined by continuity inherent in the subject-matter.
(a) Because of relations to locations in the city.
(b) Because of causal order as indicated in I, *B*.
(3) Statement of order.
(a) Directions in schoolroom and community. Making of drawings and plats according to horizontal directions.
(b) Study conditions along the most direct thoroughfare to the business center, making map of same.
(c) Physical features, slope, drainage, etc. Modeling of surface in sand.
(d) Parts of city and relation of parts: Retail and wholesale, manufacturing and shipping, residence, farm, or suburb portion. Making and interpretation of complete map.
(e) Transportation means.
(f) Products: Shelter, food, clothing; use in home; location of industries in city and reason; how products come to city and from where.
(g) Organization: Need of each working to supply another's need. Need of organizing to supply lights, protection, etc. Study of organization of fire department, etc. Need of political organization to select heads over all. Need for and determination of city limits.

b. Essentials of presentation.
(1) Procedure from that easily observed by child to that more distant.
(2) Observation by excursion work.
(3) Stimulate spirit of inquiry outside of the school.
(4) Make use of each individual's observations throughout year.
(5) Presentation of subject-matter not as isolated facts, but related, and in relations are found causes for location, etc.
(6) For making and interpretation of maps:
(a) First drawing of a whole seen at once.
(b) By easy gradations build on to map of thoroughfare map for whole city.
(c) Mark directions on map and hang on north wall for first comprehension of map directions.

C. Superficial Study of the World as a Whole. Aim, as determined in III, *E*, to bring out (1) relation of child's community to distant regions, (2) physical, climatic, productive, and life conditions in the distant region. (3) Incidental aims: The comprehension

of land forms. To gain a conception of the shape and climatic conditions of the earth.

1. Fourth grade.
   a. Order and choice of the subject-matter.
      (1) Determined by intimacy and evidence of relation of the distant region to the child's environment.
      (2) Determined by simplicity of relations within the region.
      (3) Determined by necessity of selecting such regions that the whole may represent typical conditions in earth's climatic belts.
      (4) Statement of order:
         (*a*) The sphere as a whole: Relative size; shape; surface.
         (*b*) Distant land masses; as: Use and appearance of seal skin; use of fur coats to animals; determination of kind of climate seals must live in; life and appearance of seal; appearance of country, physical and climatic conditions; land form of plain and island; productive conditions; social conditions; chalk relief of northern North America on blackboard-globe; direction and distance from child's home.
         (*c*) Summary and determination of location of hot, cold, and temperate regions of the earth.
   b. Essentials of presentation:
      (1) In presenting shape of earth:
         (*a*) Avoid use of symbol until after child strives for it by attempting to determine shape from the earth itself.
         (*b*) Sizes and distances must be in terms of things experienced by child.
      (2) In presenting distant regions:
         (*a*) Distant region introduced by a product familiar to child, and one in itself, to some extent, characterizing conditions in the region.
         (*b*) Conditions must be imaged, not memorized. Use of pictures, etc.
         (*c*) Land form should be studied when it forms a part of the region studied, and there shown as affecting the life of the region and its form represented by pictures, sand model, etc.
         (*d*) By representation of relief on slated globe relation of land masses may be shown.

(3) In presenting earth's climate:

(*a*) By reviewing conditions of climate and life in each region, showing relation of tropical, polar, and temperate regions, climatic conditions of earth will be brought out.

D. Intensive Study of Regional Geography, or Continental Geography.

Aim: To apply in every specific instance the relations existing between topographic, climatic, productive, industrial, social, locative, and political conditions that—

(1) The reasoning power of the child may be developed through his self-activities or original effort.

(2) The facts learned may be seen as something more than arbitrary facts, as: reasons for location, products, etc.

(3) The child may image conditions in distant regions through the comparison with conditions he has sensed.

1. Fifth, sixth, and seventh grades.

a. Order of arrangement of the continents.

(1) Determined by child's contact and association.

(2) Determined by simplicity and unity of relations in each.

(3) Determined by importance of each in commerce and current events.

(4) Statement of order of arrangement:

(*a*) North America and important islands: Fifth grade; because of child's natural association.

(*b*) South America: Sixth grade; because of simplicity and unity of relations, especially topographic, climatic, and productive, and because of the growth of intimate associations.

(*c*) Eurasia, Africa, and Australia: Seventh grade; (Eurasia 30 weeks, Africa 7 weeks, Australia 3 weeks), because of complexity of arrangement in Eurasia and its great commercial importance, it is left till more mature age of child.

b. Order of arrangement of subject-matter in continent study.

(1) Determined by causal order as stated in aim and in I, *B*.

(2) Determined by natural deductive and inductive reasoning from image of the whole to study of the parts in detail and synthesis of the parts into a detailed whole.

(3) Statement of order of arrangement of subject-matter.

(*a*) Continent as a whole.

Physical basis of topography in relief.

Means: Sand model, chalk model, interpretation of relief map.

Division into natural topographic regions.

Climate of continent as a whole and climatic belts dependent on location of continent and its topographic regions.

Life belts of continent as a whole dependent on topographic regions and climatic belts.

(*b*) Topical study of each topographical region to bring out more in detail the physical, climatic, productive, industrial, social, and locative relations.

(*c*) Political divisions of continent in which a review of the essential characteristics of each region is built into continent as a whole.

c. Discussion of methods of presentation.

E. Extensive Study of Regional Geography; World Relations. Aim: To show world relations existing between its parts, especially as influencing conditions in child's home country. Incidental aim: A review of geography of the United States, especially through the commercial and political relations.

1. Eighth grade.

a. Order of presentation of the subject-matter.

(1) Determined by the natural causal order.

(2) Determined by the importance of the relation of the different regions upon the home region.

b. Statement of the order of presentation of the subject-matter.

(1) Physical relations:

(*a*) The earth as a whole. Primary highlands. Great slopes and drainage areas.

(*b*) The earth as a planet. Movements, inclination, and division of time.

(2) Climatic relations: Temperature and seasons; winds, rainfall.

(3) Life relations: Tropical forest, Savanna, Desert, Temperate, Sub-arctic, and Tundra belts.

(4) Commercial relations of other regions with United States. Of other regions with each other. Routes, etc.

(5) Political relations of great powers, dependencies, and protectorates.

c. Discussion of methods of presentation.

Laboratory work accompanying the second year's work. Done outside of the regular class periods.

I. Picture library: Collecting, mounting, and classifying pictures.

II. Reference library: Collecting, classifying, and binding of articles from periodicals.

III. Picture drawing: Chalk modeling of geographical forms. Blackboard drawing of pictures.

IV. Map making.

A study of the development of map making.
Sand modeling.
Chalk modeling.
Making of one papier-maché model.
Study of map projections.
Making diagramatic outlines of continents indicating parallels and meridians to determine relative sizes and distances.

GEOGRAPHICAL NOTES

Controlling Sand Dunes in the United States and Europe.—In many parts of the United States there are areas of drifting sand which are of much economic importance from the fact that they not only are useless for agricultural purposes, but may seriously encroach upon valuable property. These areas, known as sand dunes, consist of hills of sand which, when bare of vegetation, readily shift from place to place when acted upon by the wind, and are then called wandering or shifting dunes. Such dunes occur along sandy shores of the ocean, of the Great Lakes, or even along our large rivers, notably the Columbia River in Washington and Oregon. These dunes are formed from the sand which is washed up during the tides, storms, or high water in case of rivers. The sand soon dries, is blown in the direction of the prevailing winds, and forms drifts in the same manner as snow. The drifts may attain the size of hills, in some cases as much as 200 feet in height. Continuous winds blow the sand over the brow, and the whole dune thus moves slowly but irresistibly forward, covering whatever is in its track—fields, forests, ponds, rivers, buildings. The direction of the prevailing winds determines whether dunes will be formed along a sandy coast. On Lake Michigan dunes are found at various places along the south and east shore, but none along the west shore. It is

interesting to note that the dunes in this region are probably the largest and highest to be found on the continent, and are scarcely exceeded by any in Europe.

In nature sand dunes are not formed where the conditions will allow a covering of vegetation; consequently they are not found in warm regions, or only exceptionally, as the long vegetative season allows opportunity for a covering to become established; but in northern regions, where vegetation lies dormant for a considerable portion of the year, the severe winter storms may prevent such covering from forming.

The chief areas of shifting dunes to be found along the Atlantic Coast are on Cape Cod, in the vicinity of Provincetown; Southern New Jersey, near Avalon and Stone Harbor; Cape Henlopen, near Lewes, Delaware; Cape Henry, Virginia, and less extensive, though quite troublesome, dunes at Currituck, North Carolina; Isle of Palms, near Charleston, South Carolina; and Tybee Island, near Savannah, Georgia.

Sand dunes occur at various places along the Pacific Coast, as Ventura, Monterey, and Mendocino counties, California, and the coast of Oregon. The latter are minimized by the moist climate. Extensive and exceedingly troublesome dunes are found along the Columbia River in Oregon and Washington from The Dalles to Riparia. The sand is brought down during the floods and blown about during the long dry summers. Here the conditions as to rainfall are reversed, the rain coming in the winter and the dunes forming during the dry summer.

More or less successful efforts have been made at various times to "fix" the dunes and thus prevent the serious injury which they cause to valuable property.

In order to attack these problems more intelligently, the writer was sent by the Department of Agriculture to investigate the methods used in Europe, where work of this character has engaged the attention of the various Governments for fifty years or more, and where the efforts in fixation or reclamation have been more successful than anywhere else in the world.

For this purpose typical dune areas in Holland, Denmark, Prussia, and France were visited. In all cases the reclamation is carried on by the general government, sometimes assisted by the local government, as private individuals are unable to bring to bear upon the problem sufficient means or continuity of purpose.

The fundamental principle of dune fixation is to cover the sand with a layer of any material which will prevent the access of the wind to

the surface, and thus prevent drifting. The kind of covering used depends upon climatic conditions and the availability and cost of material. The aim is, when possible, to produce a forest, as this is permanent, and, moreover, if properly managed, yields an income. However, a forest can not be produced with certainty upon a surface of drifting sand, and it is therefore necessary to temporarily fix the sand in some other manner. Although any covering of inert material, such as chips, gravel, brush, etc., would answer the purpose, economic factors have reduced the preliminary methods of fixation to these: (1) transplanting beach grass; (2) covering with heather; (3) covering with a network of sand hedges.

(1) Many plants have been tried, but the most satisfactory is beach grass (*Ammophila arenaria* Link). This grass grows naturally upon the sand dunes of the north Atlantic Coast of Europe as far south as Morocco, and of America as far south as North Carolina, and also along our Great Lakes. This is the grass which was used in reclaiming the land which is now Golden Gate Park in San Francisco. It has also been imported at various other points along the Pacific Coast. To fix the sand the grass is transplanted in spring or fall and set two or three feet apart in the sand. The blowing sand is caught and held by the grass, but it has the power to grow up through the accumulated sand, and thus, with care to replant where necessary, it becomes a permanent covering. As a forest can not be established close to the ocean, a strip a few rods wide must be permanently fixed in this manner.

(2) In localities where heather is abundant this is cut with brush scythes and laid upon the surface of the sand. It is held in place by a little sand thrown over the edge of each layer.

(3) Where neither beach grass nor heather is available, or where the conditions are especially severe, sand hedges are used. These consist of rows of cut brush or stakes or of cut reeds, which are inserted in the sand in rows or quadrangles, allowing the upper end to project for six inches or more.

After the sand is temporarily fixed by one of these methods, young trees, usually conifers, are transplanted, and the forest soon removes all danger of further shifting. In southwestern France the forest was established by sowing the seed of *Pinus maritima* upon the sand and covering with brush, but this method has not been successful in Northern Europe. In France, and also the Kurische Nehrung, in Prussia, it has been found necessary to form artificially a long barrier dune between the ocean and the forest which protects the latter. This barrier dune

is fixed by means of beach grass, but requires constant oversight to keep it in order. During severe storms dangerous breaches are formed, which, if neglected, would soon destroy the dune and seriously injure the forest in its lee. These breaks are mended by sand fences, such as already described, but taller, which rapidly accumulate the sand until the hole is filled.—*National Geographic Magazine*, January, 1904.

Climate of San Francisco.—On the coast of California there is a city justly famed for the abnormalities of its climate. Overcoats and heavy wraps are worn in midsummer, while the lilies bloom in December. From May until September very little rain falls, yet during this period with clock-like regularity great banks of fog march in every afternoon and cover the bare, brown hills. The city of San Francisco, the gateway to the Orient, as it has been termed, is strangely situated with respect to ocean, bay, mountain, and valley. It may perhaps be said of this city that nowhere else can such a strange mixture of marine and continental climates be found. The topography is such that marked contrasts can be found within comparatively short distances. Certainly the climatologist finds in the vicinity of San Francisco so many climatic anomalies that he feels as if he were in fact present in a great natural aero-physical laboratory where daily experiments were being performed on a large scale. In building this meteorological laboratory at San Francisco nature also provided seats wherefrom we can obtain excellent views of the experiments while in progress. From the Weather Bureau station on Mount Tamalpais—elevation of station, 2,373 feet—one looks down on the broad expanse of the Pacific, nearly 20,000,000 square miles of water, to the north, west, and south. From the open roadstead of Drakes Bay, the eye passes over the Sausalito hills to the headlands of Points Bonita and Lobos, marking the entrance to the Golden Gate. This passage plays an important rôle in connection with the winds, temperatures, and fogs of the San Francisco Bay region. At mean tide the area of San Francisco Bay is about 450 square miles.

Far on the eastern horizon, especially on clear winter days, the snow of the Sierra—155 miles distant—can be seen glistening. These mountains vary in height from 8,000 to 14,000 feet.

Extending from the slopes of the Sierra to the Coast Range is a great basin 500 miles long and about 50 miles wide. The Sacramento and San Joaquin rivers, flowing through this basin, unite in Suisun Bay. This great inland basin, surrounded by mountain walls, is connected with the Pacific Ocean by the gate at San Francisco, San Fran-

cisco Bay, San Pablo Bay, Karquines Straits, and Suisun Bay. Here, then, is an aero-physical laboratory *par excellence*. Now for the results.

When a native of San Francisco is asked which is the coldest month of the year, he is generally at a loss for an answer; and if asked which is the warmest he may say November. This confusion arises from the comparatively small range of temperature. The mean annual temperature, as determined from the records of the Weather Bureau for thirty-one years, is 56.1° F. May and November have practically the same temperature. The warmest month is September, 60.8°; the coldest, January, 50.2°. The other months have mean temperatures as follows: February, 52°; March, 54°; April, 55°; May, 57°; June, July, and August, 59°; October, 60°; November, 56°; December, 52°.

The highest temperature ever recorded in San Francisco was 100°, on June 29, 1891, and the lowest 29°, on January 15, 1888. Abnormally warm and cold periods last, as a rule, about three days. The mean of the three consecutive warmest days at San Francisco has never exceeded 76.3°. A period of warm weather during the summer months is, as a rule, brought to a close about the evening of the third day with strong west winds, dense fog, and temperatures ranging from 49° to 54°. The mean of the three consecutive coldest days was 40.7°. The greatest daily range of temperature was 43°, on June 29, 1891. This was the date when the temperature reached 100°. The range of temperature was from 100° to 57°. The morning was calm and very warm, while at 5 P. M. the temperature was 80°, and next morning 74°.

In the past thirty years the number of days on which snow has fallen can be counted on ten fingers. Thunderstorms likewise are infrequent, but not altogether unknown. Earthquakes, meaning by this all slight shocks and tremors, average about seven per annum. Little damage has been done by earthquakes during the past fifty years.

The people in San Francisco have long realized that winter and summer are purely relative terms. Thus at any of the ferries on a midsummer day one can see summer fabrics worn with heavy wraps, and it is not unusual to see white duck and sealskin in combination. Visitors to the city should by all means wear heavy wraps or overcoats during the summer afternoon.

The experiments of the observers of the Weather Bureau during the past two years with kites have thrown much light upon the causes of the climatic abnormalities experienced at San Francisco; and, among other things, it has become evident that in summer as we ascend from the ground the temperature rises. For each 155 feet of elevation the

temperature is 1° F. warmer, and so on any of the hills or mountains in the vicinity of San Francisco one can find with very little effort the climate best suited for him. In other words, the citizen of the San Francisco Bay section can regulate the temperature to suit himself, having a choice between 55° at sea level and 85° at 2,000 feet above.

With regard to rainfall during the summer months, San Francisco is practically rainless. The average rainfall is about 23 inches, and most of this falls during the months of November, December, January, February, and March. Looking over the records of the past fifty years we find that the year 1898 had but 9.31 inches, while in 1893 there was 38.82 inches. In 1861 there was 38.51 inches.—*Bulletin L, Climatology of California, U. S. Weather Bureau.*

Current Articles on Commerce and Industry.—

JANUARY

Automobiles (Illus.), *Sci. Am.* (*Special Edition*), January 30.

Canada's Ability as a Wheat Producer, *Bradstreet's*, January 9.

Cod-liver Oil of Norway, *Bradstreet's*, January 23.

Colombia: The Government and People and Country (Illus.), *World's Work.*

Corn: The World's Corn King (Illus.), *Export Implement Age.*

Cuba: Commercial Notes, *Consular Rep.*

Engineering Retrospect of 1903, *Sci. Am.*, January 2.

English Walnut in Southern California (Illus.), *Rev. of Revs.*

Erie Canal, Electricity on (Illus.), *Sci. Am.*, January 9.

Germany, Commerce and Industries of, *Consular Rep.*

Hudson Bay: Canada's Undeveloped Empire (Illus.), *World To-Day.*

India: Impressions of the Far East (Illus.), *World To-Day.*

Invention, Connecticut the Home of, *World's Work.*

Japan, Industrial Development in, *Consular Rep.*

Korea, Commerce and Resources of, *Bradstreet's*, January 23.

Locomotive Industry (Illus.), *System.*

Logging in the South, *Miss. Valley Lumberman*, January 22.

Lumber By-products, *Miss. Valley Lumberman*, January 29.

Mississippi: The Great River (Illus.), *World To-Day.*

Oil: New Texan Deposits (Illus.), *Sci. Am.*, January 30.

Oil Industry of the Southwest (Illus.), *Rev. of Revs.*

Panama Canal and Railway Traffic, *Bradstreet's.*

Peach Farm in Michigan (Illus.), *Country Life.*

Philippines: How They Advertise Shoes, *Hide and Leather*, January 30.

Pine: Sugar and White Pine of California, *Miss. Valley Lumberman*, January 22.

Prune Industry of California, *Comm. Bull. and N. W. Trade*, January 23.

Ramie Fiber, *Manufacturer*, January 15

Riviera, Journey on (Illus.), *World To-Day*.

Rookwood Pottery (Illus.), *Clay Worker*.

St. Louis: Character Sketches of Cities (Illus.), *World To-Day*.

Seal Hunting with Eskimos (Illus.), *World's Work*.

Sewing Machine, Invention of (Illus.), *Sci. Am.*, January 23.

Standard Oil Co.: Pipe Line Wars (Illus.), *McClure's Mag.*

Texas Cattle Fever (Illus.), *Rev. of Revs.*

Wheat: American Sources of British Wheat Supply, *Bradstreet's*, January 23.

Wool, History of American, *Comm. Bull.* (Boston), January 2.

GEOGRAPHICAL QUERIES

A CLEARING HOUSE FOR GEOGRAPHICAL WANTS AND DOUBTS.

IT is hoped this department will prove of practical benefit to teachers of geography, opening a way for the solving of the many geographical problems which are constantly met with in the classroom. All questions received will be answered by specialists in the various methods of geographical work. We invite inquiries, criticisms, suggestions, and discussions. Address all communications for this department to: EDWARD M. LEHNERTS, *Winona, Minn.*

(7) For some time I have vainly tried to find a satisfactory explanation of the Northern Lights. I have no access to a good library, which partly accounts for my failure. Please give me the name of some book in which I can find the information; or better, if you have the time, explain it to me. CELIA VAN DERVOORT, Clontarf, Minn.

No completely satisfactory explanation of the Northern Lights, or Aurora Borealis, is known, though it is quite generally believed that it is due to electric disturbances in the upper atmosphere. It may be something like the phenomena seen in a Crookes tube, when an electric current is passed through the rarefied air. From observations in different latitudes made at the same time the auroral light has been found to extend from fifty to one hundred miles in height in the northern ends, to about five hundred at the southern.

The belief in its electrical origin is based on the fact that brilliant auroral displays are nearly always accompanied by magnetic dis-

turbances, which have sometimes been so severe as to interfere with telegraph and telephone lines.

The auroral displays are more frequent at the times of great sun-spot activities, which have their maxima every eleven years. We are now near the period of maximum display.

The subject is treated in such standard works on physics as Ganot's and Deschanel's. An interesting paper, No. 1384, "Comets' Tails, the Corona, and the Aurora Borealis," by John Cox, may be obtained free of charge from the Smithsonian Institution, Washington, D. C.

The University of Chicago. F. R. MOULTON,

EDITORIAL

THE GEOGRAPHIC CONGRESS AND THE SCHOOL TEACHER

THE circular reprinted on another page explaining the plans of the Eighth International Geographic Congress which is to assemble in Washington and journey to St. Louis next September, merits the careful attention of all teachers of geography. Membership in the Congress is open, under reasonably simple conditions, to all interested persons. Attendance upon at least some sessions is made possible to a great number of teachers by the progress of the Congress through the cities of Washington, Baltimore, Philadelphia, New York, Niagara, Chicago, and St. Louis; the details of this progress will be given later in the programs of various local committees. The Congress will probably bring together a large number of geographers, European and American, and the sessions, receptions, and excursions in the several cities will give opportunity for personal intercourse as well as for the presentation and discussion of geographical problems. The published proceedings of the Congress will be sent to all members. There can be no question that teachers of geography will profit by attending the Congress, but the other side of the question is also important; the Congress will profit by the attendance of the teachers.

Large numbers in the attendance upon International Congresses are desirable, not only as an aid in meeting the considerable expenses incurred in the sessions, but still more as a means of exhibiting the national status of the subject with which the Congress is concerned. For the latter reason it is particularly important that teachers of geography in our normal and high schools should be well represented in the coming Geographic Congress, and it is not now too early to begin to make plans whereby absence from school duties may be allowed on

those days when accessible sessions of the Congress are held. It is probable that the educational aspects of geography will be made the special subject of one or more sessions, in which contributions will be especially appropriate from experienced teachers of geography in colleges and normal schools. The JOURNAL will publish the plans as they mature and will make special note of any details of particular interest to teachers.

Correspondence regarding membership and general information should be addressed to International Geographic Congress, Hubbard Memorial Hall, Washington, D. C.; regarding the general scientific program of the sessions, to Professor W. M. Davis, Cambridge, Mass.; regarding the educational division of the program, to Professor Richard E. Dodge, Teachers College, New York City.

RECENT PUBLICATIONS

A Laboratory Manual of Physical Geography. Part I, Directions for Teachers; Part II, Laboratory Exercises. By Frank W. Darling and four instructors in the Chicago High Schools. Chicago and Boston: Atkinson & Mentzer, 1903.

The authors have prepared a helpful and suggestive manual of value to all High and Normal School teachers. There is some question as to the advisability of including the study of minerals in Physical Geography as is done here. To be reviewed later.

The Cumberland Road, Being Volume X in the Historic Highways of America Series. By Archer B. Hulbert. Pp. 208. Cleveland, Ohio: The Arthur H. Clark Company, 1904.

The latest volume in the series of Historic Highways of America is much like its predecessors in scope and form. Of interest to all students of the history of geography and the geography of history in the United States.

The Philippine Islands, 1493–1898. Edited and annotated by Emma H. Blair and James A. Robertson. Vol. VIII, 1591–1593, pp. 320, 1903; and Vol. IX, 1593–1597, pp. 329, 1904. Cleveland, Ohio: Arthur H. Clark Company.

These volumes continue the account of the Philippines begun in the other volumes already noted in the JOURNAL, and carry the story to the end of the first century. Many facts are of interest to the general reader, but the series is of particular value to the student of geographical history.

Summary and Outline of Geography Course for the Grades of Chicago Public Schools. Pp. 160. Published by the Board of Education, 1903.

A valuable contribution to educational geography. A well-ordered and sensible course of study. Contains excellent references and is of value to all grade teachers.

The Tree-Dwellers. By Katherine E. Dopp. Pp. 158. Chicago: Rand, McNally & Co., 1903.

The first of a series of books on primitive life, for use as a reader in elementary grades. Pleasing in form and illustration. To be reviewed later.

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NEWS NOTES

PRELIMINARY ANNOUNCEMENT

Eighth International Geographic Congress, Washington, 1904.

HUBBARD MEMORIAL HALL,
WASHINGTON, D. C., U. S. A., January, 1904.

The Executive Committee of the Seventh International Geographic Congress held in Berlin in 1899 having voted to convoke its next session in Washington, the National Geographic Society, as the organization responsible for the management of the sessions in the United States, will welcome the Eighth Congress and its friends to the National Capital of the United States in September, 1904.

Geographers and promoters of geography throughout the World, especially members of Geographic Societies and cognate institutions of scientific character, are cordially invited to assemble in Washington, D. C., on September 8, 1904, for the first international meeting of geographers in the Western Hemisphere.

On the invitation of the National Geographic Society, the following Societies join in welcoming the Congress and undertake to coöperate toward its success, especially in so far as sessions to be held in their respective cities are concerned :

The American Geographical Society.
The Geographic Society of Baltimore.
The Geographic Society of Chicago.
The Geographical Society of California.
The Mazamas.
The Peary Arctic Club.
The Geographical Society of Philadelphia.
The Appalachian Mountain Club.
The Geographical Society of the Pacific.
The Sierra Club.
The American Alpine Club.
The Harvard Travellers Club.

Sessions. The Congress will convene in Washington on Thursday, September 8th, in the new home of the National Geographic Society, and will hold sessions on the 9th and 10th, the latter under the auspices of the Geographic Society of Baltimore. Leaving Washington on the 12th, the members, associates, and guests of the Congress will be entertained during that day by the Geographical Society of Philadelphia,

and on the 13th, 14th, and 15th by the American Geographical Society in New York, where scientific sessions will be held; on the 16th they will have the opportunity of visiting Niagara Falls (en route westward by special train), and on the 17th will be entertained by the Geographic Society of Chicago; and on Monday and Tuesday, September 19th and 20th, they will be invited to participate in the International Congress of Arts and Science connected with the World's Fair in St. Louis. Arrangements will be made here for visiting exhibits of geographic interest.

Excursions. In case any considerable number of members and associates so desire, a Far-West excursion will be provided from St. Louis to the City of Mexico, thence to Santa Fé, thence to the Grand Canyon of the Colorado, and on to San Francisco and the Golden Gate, where the western Geographic Societies will extend special hospitality; afterward returning by any preferred route through the Rocky Mountains and the interior plains to the eastern ports.

If the membership and finances warrant, the foreign delegates will be made guests of the Congress from Washington to St. Louis, via Baltimore, Philadelphia, New York, Niagara Falls, and Chicago. On the Far-West excursion special terms will be secured, reducing the aggregate cost of transportation with sleeping-car accommodations and meals materially below the customary rates. It may be necessary to limit the number of persons on the Far-West excursion. It is planned also to secure special rates for transportation of foreign members from one or more European ports to New York, provided requisite information as to the convenience and pleasure of such members be obtained in time. Final information on these points will be given in the Preliminary Program of June, 1904.

The subjects for treatment and discussion in the Congress may be classified as follows:

1. Physical Geography, including Geomorphology, Meteorology, Hydrology, etc.
2. Mathematical Geography, including Geodesy and Geophysics.
3. Biogeography, including Botany and Zoölogy in their geographic aspects.
4. Anthropogeography, including Ethnology.
5. Descriptive Geography, including Explorations and Surveys.
6. Geographic Technology, including Cartography, Bibliography, etc.
7. Commercial and Industrial Geography.
8. History of Geography.
9. Geographic Education.

A special opportunity will be afforded for the discussion of methods of surveying and map making, and for the comparison of these methods as pursued in other countries with the work of the Federal and State Surveys maintained in this country.

Membership. Members of the Congress will be entitled to participate in all sessions and excursions, and to attend all social meetings in honor of the Congress; they will also (whether in attendance or not) receive the publications of the Congress, including the daily Program and the final Compte Rendu, or volume of proceedings. Membership may be acquired by members of Geographic and cognate Societies on payment of $5 (25 francs, one pound, or 20 marks) to the Committee of Arrangements. Persons not members of such societies may acquire membership by a similar payment and election by the Presidency. Ladies and minors accompanying members may be registered as associates on payment of $2.50 (12½ francs, or 10 shillings, or 10 marks); they shall enjoy all privileges of members except the rights of voting and of receiving publications.

Geographers and their friends desirous of attending the Congress or receiving its publications are requested to signify their intention at the earliest practicable date in order that subsequent announcements may be sent them without delay, and that requisite arrangements for transportation may be effected. On receipt of subscriptions, members' and associates' tickets will be mailed to the subscribers. The privileges of the Congress, including the excursions and the social gatherings, can be extended only to holders of tickets.

Societies and Delegates. It is earnestly hoped that the Congress of 1904 may be an assemblage of Geographic and cognate Institutions no less than of individual Geographers; and to this end a special invitation is extended to such organizations to participate in the Congress through Delegates on the basis of one for each one hundred members up to a maximum of ten. No charge will be made for the registration of Institutions, though the Delegates will be expected to subscribe as Members; and in order that the list of affiliated Institutions (to be issued in a later announcement) may be worthy of full confidence, the Committee of Arrangements reserve the right to withhold the name of any Institution pending action by the Presidency. The publications of the Congress will be sent free to all Institutions registered. It is especially desired that the Geographic Societies of the Western Hemisphere may utilize the opportunity afforded by this Congress for establishing closer relations with those of the Old World, and to facilitate this, Spanish will be recognized as one of the languages of the Congress

with French, English, German, and Italian, in accordance with previous usage; and communications before the Congress may be written in any one (or more) of these languages.

Institutions not strictly Geographic in character, Libraries, Universities, Academies of Science, and Scientific Societies are especially invited to subscribe as members in order to receive the publications of the Congress as issued.

Communications. Members and Delegates desirous of presenting communications before the Congress, or wishing to propose subjects for discussion, are requested to signify their wishes at the earliest practicable date in order that the titles or subjects may be incorporated in a Preliminary Program to be issued in June, 1904. The time required for presenting communications should be stated, otherwise twelve minutes will be allotted. It is anticipated that not more than twenty minutes can be allotted for any communication unless the Presidency decide to extend the time by reason of the general interest or importance of the subject. The Presidency with the complete Organization of the Congress (including Delegates) will be announced in the Preliminary Program of June, 1904.

Program. All papers or abstracts designed for presentation before the Congress, and all proposals and applications affecting the Congress, will be submitted to a Program Committee who shall decide whether the same are appropriate for incorporation in the announcements, though the decisions of this Committee shall be subject to revision by the Presidency after the Congress convenes.

Any proposal affecting the organization of the Congress or the program for the Washington session must be received in writing not later than May 1, 1904. Communications designed to be printed in connection with the Congress must be received not later than June 1, and any abstracts of communications (not exceeding 300 words in length) designed for printing in the General Program to be published at the beginning of the Congress must be received not later than August 1, 1904. Daily Programs will be issued during the sessions.

All correspondence relating to the Congress and all remittances should be addressed: The Eighth International Geographic Congress, Hubbard Memorial Hall, Washington, D. C., U. S. A.

COMMITTEE OF ARRANGEMENTS

W. J. McGee, National Geographic Society, Washington, D. C., *Chairman.*

Henry G. Bryant, Geographical Society of Philadelphia.

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George B. Shattuck, Geographic Society of Baltimore.
A. Lawrence Rotch, Appalachian Mountain Club, Boston.
Zonia Baber, Geographic Society of Chicago.
George Davidson, Geographical Society of the Pacific, San Francisco.
Frederick W. d'Evelyn, Geographical Society of California, San Francisco.
John Muir, Sierra Club, San Francisco.
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Angelo Heilprin, American Alpine Club.
Herbert L. Bridgman, Peary Arctic Club.
William Morris Davis, Harvard Travellers Club.
J. H. McCormick, *Secretary*.

FINANCE COMMITTEE

John Joy Edson, President Washington Loan & Trust Company, *Chairman*.
David T. Day, United States Geological Survey.
Charles J. Bell, President American Security & Trust Company.

National Educational Association, 1904.—The first of the many important educational meetings to be held at St. Louis in 1904 is the National Educational Association. This convention will be held from June 28 to July 1. Details of the geographical program will be published in the JOURNAL OF GEOGRAPHY when it has been completed. In anticipation of this meeting the JOURNAL will issue, the last of May or early in June, a special number devoted to "The Geography of the Louisiana Purchase." The Purchase has never before been so completely written up from a geographical standpoint.

Bulletin of the American Geographical Society. — The Editors of the JOURNAL note with pleasure a change in plan whereby the *Bulletin* of the American Geographical Society will hereafter be published monthly instead of five times a year. The *Bulletin* is the oldest regular geographical periodical in the country, and represents the oldest and most renowned Geographical Society. The geographical interests of America are so large and so increasing in scope that there is plenty of opportunity for two monthly periodicals devoted primarily to advancing the science of geography. Although the *Bulletin*, like its companion, the *National Geographic Magazine*, will devote a certain amount of attention to educational geography, neither paper will cover the field which the JOURNAL OF GEOGRAPHY and its predecessors have occupied for more than seven years.

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Physiography and Geography

GEOGRAPHY *is a study of the earth as the home of man, hence we have two elements in the study of geography: the earth and man. In one extreme the study of geography is led toward pure physiography which is a branch of geology, on the other extreme toward sociology or history, or some other branch of the study of man. Neither aspect of geography should, however, be studied for itself, but solely with reference to the relation of earth and man. The utilization of physiography in geography study is rational, well founded, and scientific. If we are to have a study of the earth as the home of man, we must have some familiarity with the earth. Physiography in the relation of the earth to man tells not merely the facts of importance, but the reasons as well, and helps in geography study to introduce the element of interest—an element sadly lacking in much geography work. Physiographic features determine the industrial, commercial, and political aspects of a section of country. Knowing the climate and products of the United States one can predict with a considerable degree of certainty what occupations would be carried on in that country. Therefore, physiography should be taught in a way that brings out this relationship. Make use of causes in explaining effects of a geographic nature and you will make geography interesting. This is rational geographic teaching.—RALPH S. TARR.*

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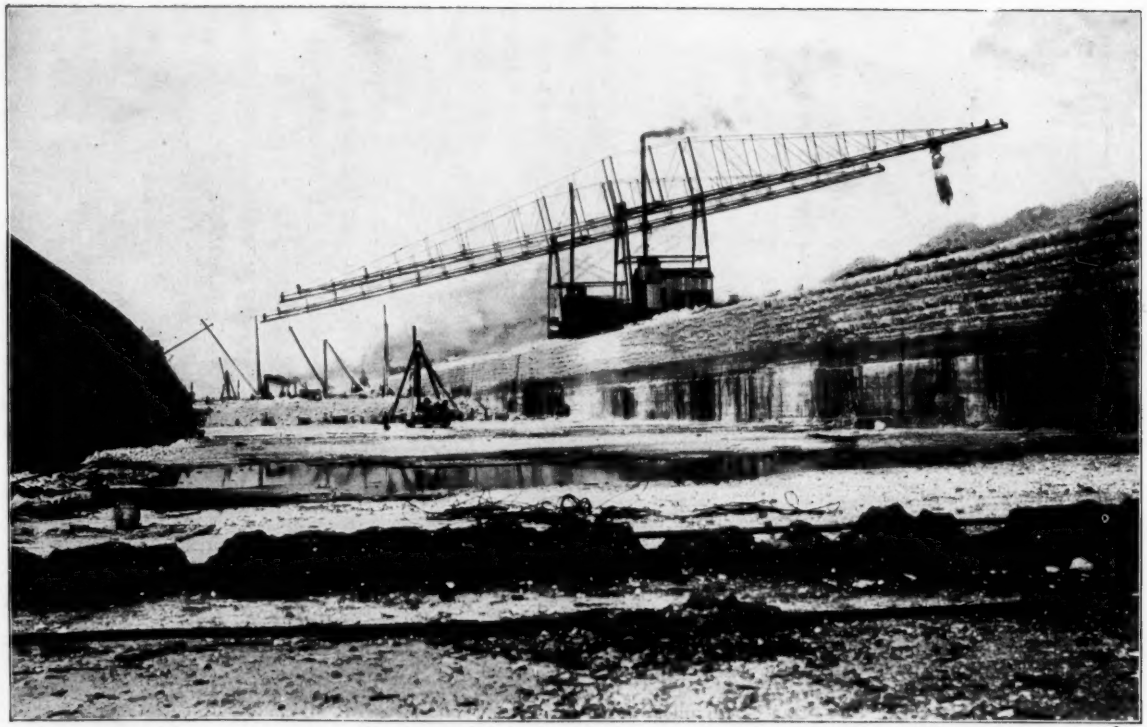

FIG. 13. *A view of work on a big cut in the Chicago Sanitary and Ship Canal.*

The Chicago drainage canal was one of the most stupendous undertakings ever carried out by the city of Chicago. It provides for the disposition of Chicago sewage through an artificial canal from Lake Michigan through Chicago to the nearest point on the Illinois River at Lockport. *See page 157*